

ALTERNATIVES TO EVOLUTIONARY OPTIMIZATION ALGORITHMS IN THE CONTEXT OF TRADITIONAL STOCHASTIC OPTIMIZATION METHODS IN THE SMART AREA TECHNICAL EQUIPMENT APPLICATION

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Abstract: In recent years, the use of evolutionary computational techniques has become widespread in many technical disciplines including, but not limited, neural networks and evolutionary algorithms. From these techniques, in the field of global optimization, mainly the evolutionary optimization algorithms are used. Because of this biological inspiration, the principle of genetic algorithms is easily understood by non-mathematicians as well. However, from the mathematical point of view, the evolutionary and genetic algorithms are just another representatives of stochastic optimization algorithms. The aim of our research was to describe the basic properties of stochastic algorithms including genetic algorithms, to select suitable candidates from the class of traditional stochastic algorithms and to compare their behaviour with the genetic algorithms. The stochastic optimization algorithms provide the advantage of efficient working even with such functions. An important criterion for optimization is also the ability to parallelize a task. The optimization algorithms can be implemented as a parallel system – we calculate the value of a purpose function at several points at the same time. We can use this for some tasks (for example, if we have a device that can perform multiple measurements at a time), but there are tasks, where this process does not provide any acceleration. This feature of the task will be called the ability to parallelize a task. The paper will also describe the specific described implementation and testing of selected algorithms on analytical functions as well as functions mediated by artificial neural networks, which have been learned on practice data and are intended, therefore, to simulate real problems in practice. Furthermore, the aim of our research was also to select those representatives of traditional stochastic algorithms that would be able to compete with the genetic algorithms by their accuracy or speed, to implement these algorithms and to test them on specific data. The paper will provide description of the algorithms where the algorithms will be compared from the theoretical point of view and such algorithms that are suitable for comparison with the genetic algorithms will be selected. In addition, we will describe how the specific methods have been implemented, how they have been modified compared to the basic version, and how the constants of these algorithms have been set. Last but not least, the results of testing of each algorithm on the practice data will be presented and, in the final phase, these results will be analysed.